Amendments to the Specification

Paragraph starting on line 1 of page 6.

The design of the sensor 10 may provide for low cost and high volume manufacturing of the sensor. The sensor design, as in Figure 2, may use Swageloc™ fittings 12 and/or fabricated high temperature ceramic feed-through insulators 13 and/or connectors. A probe 14 of sensor 10 may be placed in the path of the exhaust of the engine. The length 15 and diameter 16 of probe 14 may be varied depending on the parameters of sensing and the engine. Probe 14 is ~~pacivated~~passivated with a very thin non-conductive coating or layer 17. This coating or layer 17 accounts for the lack of electrical shorting by the soot layer accumulated by probe 14 during operation of the engine. "Pacivate" may be similar to "passivate", although the term passivate and variants of it are used in the present description. The ~~pacivation~~passivation material may be composed of SiN4, cerium and the like. The thickness of the ~~pacivation~~passivation layer on probe 14 may be between 0.001 and 0.100 inch. A nominal thickness may be about 0.01 inch. The ~~pacivation~~passivation layer may be achieved with the exposure of the probe to high exhaust gas temperatures or may be coated with such layer vie a material added to the engine fuel.

Paragraph starting on line 4 of page 7.

An embodiment of sensor 10 may be a standard spark plug 11 (such as a Champion™ RJ19LM, though the model is not important) that has the outside electrode removed and has a 4 to 6 inch stainless steel extension 14 of about 1/8 inch diameter welded to the center electrode. Sensor 10 may be mounted in the exhaust stream 23 near the exhaust manifold 22 or after the ~~turbocharge~~turbocharger 19. The electrode 14 may be connected to a standard analog change amplifier in processor 26 to record charge transient 25 in the exhaust stream 23. The charge transients may be directly proportional to the soot (particulate) concentration in the exhaust stream 23. The extended electrode 14 may be ~~pacivated~~passivated with a very thin non-conducting surface layer 17, so that the electrode 14 will develop an image charge from the exhaust particulates but will not be electrically shorted to the spark plug 11 base or the grounded exhaust pipe 18. The ~~pacivating~~passivating layer 17 may be deposited or grown on the electrode 14. The 304 stainless steel may grow this ~~pacivating~~passivating layer 17 spontaneously after a few minutes of operation in the exhaust stream 23 at elevated temperatures greater than 400 degrees C (752 degrees F).

Other grades of stainless steel (e.g., 316) might not spontaneously grow the ~~pacivating~~passivating layer 17. However, a ~~pacivating~~passivating layer 17 of cerium oxide may be grown on these other grades of stainless steel by adding an organometalic cerium compound (about 100 ppm) to the fuel for the engine 21.

Paragraph starting on line 7 on page 8.

Other methods of ~~pacivating~~passivating the electrode 14 with a layer 17 may include sputter depositing refractory ceramic materials or growing oxide layers in controlled environments. The purpose of the ~~pacivating~~passivating layer on electrode 14 is to prevent electrical shorts between the electrode 14 and the base of spark plug 11 due to particulate buildups, so that sensor 10 may retain its image charge monitoring activity of the exhaust stream 23. If electrode 14 did not have the ~~pacivating~~passivating layer 17, sensor 10 may fail after a brief operating period because of a shorting of electrode 14 to the base of plug 11 due to a build up of conductive soot on the electrode 14.